

Sacramento-San Joaquin Delta Ecological Management Zone will help in the recovery of these species by increasing habitat quality and area.

INTEGRATION WITH OTHER RESTORATION PROGRAMS

Restoration projects to improve upland and wetland agriculture and seasonal wetland and riparian habitats would be closely linked to the restoration of these species.

Efforts to recover western pond turtle populations will involve cooperation and support from other established programs aimed at restoring habitat and populations.

Wetland restoration and management programs that would improve habitat for these species include the Agricultural Stabilization and Conservation Service's Wetland Reserve Program, the Wildlife Conservation Board's Inland Wetlands Conservation Program, restoration programs administered by Ducks Unlimited and the California Waterfowl Association, and ongoing management of State and federal wildlife refuges and private duck clubs. Restoration efforts will be conducted in cooperation with agencies or organizations with responsibility or authority for restoring wetland and aquatic habitats, including DFG, California Department of Water Resources, USFWS, U.S. Army Corps of Engineers, and the Delta Protection Commission. USFWS is also preparing a recovery plan for the giant garter snake that will establish population recovery goals.

LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

Restoration of ecosystem processes and habitats proposed by ERPP in other ecological management zones will also allow natural floodplains, stream meanders, and seasonal pools to develop that assist in the recovery of their populations elsewhere in their historic ranges.

OBJECTIVE, TARGETS, ACTIONS, AND MEASURES



The Strategic Objective is to maintain abundance and distribution.

SPECIES TARGET: An increase in or no discernable adverse effect on the size or distribution of species populations.

LONG-TERM OBJECTIVE: Restore self-sustaining populations of western pond turtles to habitats throughout the Bay-Delta watershed including the Delta.

SHORT-TERM OBJECTIVE: Determine the status and habitat requirements of pond turtles throughout the region and develop a conservation strategy in concert with habitat protection measures.

RATIONALE: The western pond turtle is the only turtle native to the Central Valley region and to much of the western United States. Although considered to be just one widely distributed species, it is likely that the pond turtle is a complex of closely related species, each adapted for a different region. The Pacific pond turtle is still common enough in the Bay-Delta watershed so that it is not difficult to find them in habitats ranging from sloughs of the Delta and Suisun Marsh to pools in small streams. The problem is that most individuals seen are large, old individuals; hatchlings and small turtles are increasingly rare. The causes of the poor reproductive success are not well understood but factors that need to be considered include elimination of suitable breeding sites, predation on hatchlings by non-native predators (e.g., largemouth bass, bullfrogs), predation on eggs by non-native wild pigs, diseases introduced by non-native turtles, and shortage of safe upland over-wintering refuges. If present trends continue, the western pond turtle will deserve listing as a threatened species (it may already).

STAGE 1 EXPECTATIONS: Populations of turtles that appear to still have successful reproduction will have been located and protected, in conjunction with other habitat protection measures. Causes of the decline should be determined and a recovery plan developed based on the findings.

RESTORATION ACTIONS

The general target is to increase the population size of western pond turtles.

General programmatic actions to protect occupied habitat areas include the following:

- Implement a preservation plan to protect these areas from adverse effects associated with human encroachment and recreation,
- Create canals, side channels, and backflow pools containing emergent vegetation within the South, East, and North Delta Ecological Management Units of the Sacramento-San Joaquin Delta Ecological Management Zone to provide forage habitat and escape cover, and create dispersal corridors by linking habitat areas.
- Restore suitable adjacent upland habitat or modify land use practices to render existing uplands as suitable habitat and reestablish connectivity between wetland and upland habitat areas, provide nest and hibernation sites, and provide refuge habitat during floods.
- Create buffer zones where none currently exist to improve habitat value.

MSCS CONSERVATION MEASURE

The following conservation measure was included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions that would help achieve species habitat or population targets.

- To the extent practicable, capture individuals from habitat areas that would be affected by CALFED actions and relocate them to nearby suitable existing, restored, or enhanced habitat areas.

REFERENCES

- Multi-Species Conservation Strategy. 2000. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.
- Strategic Plan for Ecosystem Restoration. 2000. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.

◆ CALIFORNIA FRESHWATER SHRIMP



INTRODUCTION

The California freshwater shrimp is found in three California counties, Marin, Napa, and Sonoma. The shrimp has apparently been extirpated from five of ten streams in which it occurred during 1964 (Eng 1981). During a subsequent distribution study of the species, shrimp were found to inhabit six additional streams (Serpa 1991). Habitat loss and alteration have been the primary causes for its demise. Urbanization, agricultural development, overgrazing, and dam and road construction have contributed to habitat loss.

RESOURCE DESCRIPTION

The California freshwater shrimp is a small shrimp, measuring less than 2.5 inches in length. It is native to Marin, Sonoma and Napa counties and represents the only remaining species of this genus. The freshwater shrimp is found in freshwater sand and gravel bottom streams at low elevation which have a gentle gradient. The shrimp occurs primarily in pool areas away from the main streamflow. The pools have undercut banks and exposed roots. The exposed roots are the preferred winter habitat. Bankside bushes, vines and sedges that extend into the water provide favorable conditions for the shrimp, especially in the late spring and summer months.

Freshwater shrimp appear to tolerate warm water temperatures ($\geq 73^{\circ}\text{F}$) and no-flow conditions that are detrimental or fatal to native salmonids. Laboratory studies indicate the freshwater shrimp should be able to tolerate brackish water conditions for short periods.

The health of California freshwater shrimp populations is adversely affected by the following general types of activities or conditions:

- urbanization
- agricultural practices
- livestock grazing and dairy farming
- timber harvesting
- gravel mining
- water development
- summer dams
- urban runoff
- wastewater discharge
- flood control
- bank protection
- culverts and grade control structures
- introduced predators.



VISION

The vision for the California freshwater shrimp is to maintain populations of this federally listed endangered species by maintaining its existing distribution and abundance.

Conservation of the California freshwater shrimp would contribute to overall species richness and diversity. Achieving this vision will reduce conflict between the need for its protection and other beneficial uses of land and water in the Bay-Delta.

Protecting existing populations from activities that could result in their loss or degradation and restoring ecological process of confined channel migration will be critical to the recovery of the shrimp. The Ecosystem Restoration Program Plan's proposed restoration of stream meander and riparian habitat in the North San Francisco Bay/Suisun Marsh Ecological Management Zones will help to protect the remaining populations in the Napa River and its tributary, Garnett Creek, Sonoma Creek and its

tributary, Yulupa Creek, and Huichica Creek. Protecting the remaining populations is an essential requirement to preventing the shrimp populations from declining to a point where restoration efforts may offer little help to the species.

Restoring these habitats while protecting and restoring streamside banks and levees would also help maintain or increase existing shrimp populations.

INTEGRATION WITH OTHER RESTORATION PROGRAMS

Other programs linked to restoring riparian systems and California freshwater shrimp habitat include:

- Huichica Creek Land Stewardship group,
- Napa County Resource Conservation District's Natural Resource Protection and Enhancement Plan,
- Napa County's integrated resource management plan for the Napa River,
- Napa County Resource Conservation District's "Adopt-A-Watershed" program,

LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

Restoration of the California freshwater shrimp population and its habitat will be integrally linked to restoration of natural stream meander corridors in the rivers of the Central Valley.

OBJECTIVE, TARGETS, ACTIONS, AND MEASURES



The Strategic Objective is to maintain abundance and distribution.

SPECIES TARGET: An increase in or no discernable adverse effect on the size or distribution of species populations.

LONG-TERM OBJECTIVE: Increase and maintain populations of California freshwater shrimp.

SHORT-TERM OBJECTIVE: Implement restoration measures designed to protect existing

populations and initiate design of a long-term conservation and restoration program.

RATIONALE: California freshwater shrimp is an endangered species that needs protection and restoration. Other restoration efforts within tributaries to the North Bay may affect the distribution and abundance of the shrimp. Specifically, management and restoration actions for the Napa River and Sonoma Creek ecological management areas must integrate actions to benefit numerous species.

STAGE 1 EXPECTATIONS: The abundance of the California freshwater shrimp will have increased and measures instituted to protect and restore the long-term viability of the shrimp populations.

RESTORATION ACTIONS

The general target is to protect exist populations in the North Bay.

General programmatic actions which will contribute to reaching the target include:

- remove existing threats to known populations of shrimp through management of shrimp populations and habitat,
- restore habitat conditions favorable to shrimp and other native aquatic species,
- protect and monitor shrimp populations and habitat once the threats have been removed and restoration has been completed,
- assess effectiveness of various conservation efforts for shrimp,
- conduct research on the biology of the species,
- restore and maintain viable shrimp population at extirpated and existing localities,
- increase public awareness and involvement in the protection of shrimp and native cohabitating species.

MSCS CONSERVATION MEASURE

The following conservation measure was included in the Multi-Species Conservation Strategy (2000) to

provide additional detail to ERP actions that would help achieve species habitat or population targets.

- To the extent consistent with ERP objectives, enhance or restore suitable habitats near occupied habitat areas.

REFERENCES

- Eng, L. 1981. Distribution, life history, and status of the California freshwater shrimp, *Syncaris pacifica*. California Department of Fish and Game. Inland Fisheries Endangered Species Program Special Publication 81-1. 27 pp.
- Multi-Species Conservation Strategy. 2000. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.
- Strategic Plan for Ecosystem Restoration. 2000. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.
- Serpa, L. 1991. California freshwater shrimp (*Syncaris pacifica*) survey for the U.S. Fish and Wildlife Service. Fish and Wildlife Enhancement, Sacramento Field Office. 17 pp.
- U.S. Fish and Wildlife Service. 1997. Draft California Freshwater Shrimp Recovery Plan. U.S. Fish and Wildlife Service, Portland Oregon. 87 pp.

◆ EEL-GRASS PONDWEED

INTRODUCTION

Aquatic habitats associated with shorelines of rivers and the Delta include shaded riverine aquatic and riparian habitats. Riverine aquatic habitat shaded by riparian vegetation provides important habitat for many species of fish, waterfowl, and wildlife. Nontidal perennial aquatic habitat is another aquatic habitat that occurs in the Bay-Delta as permanent open water that is no longer subject to tidal influences.

Riverine aquatic habitat is characterized by the relatively shallow submerged and seasonally flooded areas in estuary and river channel beds. Channel beds contain gravel beds, bars, and riffles; transient sandy shoals; waterlogged woody debris piles; and the shaded riverine aquatic habitat zone. This habitat zone is located where the river meets the riparian canopy. Riverine aquatic zones provide spawning substrate, rearing and escape cover, feeding sites, and refuge from turbulent stormflows for fish and other aquatic organisms. Riparian and riverine aquatic habitats are created and sustained by natural fluvial processes associated with rivers.

The nontidal perennial aquatic habitat is present in certain low-elevation areas in the Bay-Delta estuary. In many places within the Delta, this habitat type has replaced the native tidal aquatic habitats that existed prior to reclamation. Most nontidal perennial aquatic habitat areas were established by constructing dikes and levees as part of reclamation activities. As land was converted to agricultural uses, perennial aquatic habitats established in large agricultural drains; small farm ponds; industrial ponds; ponds managed for waterfowl and other wildlife; and Delta island blowout ponds, which were created by levee failures that scoured island interiors deeply enough to maintain permanent water through seepage. Some historical nontidal perennial habitat was created naturally as a result of shifts in river alignments that occasionally resulted in establishment of isolated oxbow lakes. Eel-grass pondweed (*Potamogeton zosteriformis*) is the only aquatic habitat special-status plant species that is expected to occur in the study area.

SPECIES DESCRIPTION

Eel-grass pondweed (*Potamogeton zosteriformis*) is an annual aquatic plant with narrow linear leaves that grows less than 24 inches tall and is submerged in ditches, ponds, lakes, and slow-moving streams generally below the 5,000-foot elevation (Mason 1957, Hickman 1993). Eel-grass pondweed is more common outside the State of California, although suitable habitat exists for it in the Central Valley, where it is considered rare. It is known to have occurred in Lassen, Shasta, and Modoc Counties in the State based on six records in the California Department of Fish and Game Natural Diversity Data Base (1996) that were documented between 1897 and 1949. Eel-grass pondweed is expected to occur in the San Joaquin River Delta (Mason 1957, Munz and Keck 1973). The species has not been listed for protection by the State or the federal government. It has been assigned to List 2 by the California Native Plant Society (Skinner and Pavlik 1994).



VISION

The vision for eel-grass pondweed is to maintain populations of this California Native Plant Society List 2 plant species.

The overall vision for aquatic habitat plant species is to provide protection for and enhance existing populations. The vision for eel-grass pondweed and other aquatic habitat plant species should be initiated by conducting surveys in the project area to identify locations of sites. Following identification of sites, it will be necessary to conduct site-based evaluations of populations, develop criteria on habitat and population conditions, and rank all sites based on the criteria in terms of low- to high-quality. Higher ranked sites should be identified for protection. Restoration efforts should be focused on restoring existing habitat and promoting establishment of aquatic plant species on restored sites or at other sites with suitable habitats.

Existing populations of aquatic species should be protected through acquisition or cooperative efforts

with landowners, beginning with the highest quality sites.

INTEGRATION WITH OTHER RESTORATION PROGRAMS

Efforts to achieve the vision for riverine aquatic habitat (including riparian habitat) may involve coordination with other programs. These include:

- U.S. Army Corps of Engineers proposed reevaluation of the Sacramento River flood control project and ongoing bank protection project, including more comprehensive floodplain management and river ecosystem restoration opportunities;
- SB 1086 Advisory Council efforts and river corridor management plan for the Sacramento River;
- the San Joaquin River Parkway and Management plans;
- ongoing Sacramento Valley conservation planning by the Nature Conservancy and other private nonprofit conservation organizations;
- expansion plans and conservation easements underway for the Sacramento River National Wildlife Refuge and California Department of Fish and Game Sacramento River Wildlife Management Area; and
- ongoing coordination efforts and programs of the Wildlife Conservation Board, including the Riparian Habitat Joint Venture.

LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

Riverine aquatic habitat is important to many fish, wildlife, and plant species and communities. It is adversely affected by stressors that include levee construction, gravel mining, flow patterns, fragmentation of existing stands of riparian vegetation, competition and displacement by non-native plant species.

Restoration of nontidal perennial aquatic habitat is linked with ecosystem processes including:

- the geologic and hydrologic condition, stream meander, and tidal function necessary to maintain permanent surface water;
- a range of elevations sufficient to support deep-water (greater than 3 feet in depth) and shallow-water areas; and
- adjacent wetland and riparian (streambank) vegetation.

The value of nontidal perennial aquatic habitat to wildlife greatly increases if emergent vegetation is present along shorelines and in shallow-water areas. Adjacent dense upland herbaceous vegetation and riparian woodland further increase the value to wildlife.

OBJECTIVE, TARGETS, ACTIONS, AND MEASURES



The Strategic Objective is to maintain abundance and distribution.

SPECIES TARGET: An increase in or no discernable adverse effect on the size or distribution of species populations.

LONG-TERM OBJECTIVE: Have self-sustaining populations of eel-grass pondweed located throughout their original native range in marshes associated with the Bay-Delta estuary.

SHORT-TERM OBJECTIVE: Protect existing populations of the species and restore habitat to provide sites for expansion of all rare native species that require nontidal aquatic habitat.

RATIONALE: Eel-grass pondweed requires nontidal aquatic habitat. The restoration of nontidal aquatic habitat should provide for a diversity of plant and animal species including eel-grass pondweed.

STAGE 1 EXPECTATIONS: The status of eel-grass pondweed will have improved. Surveys of present ranges of the species, studies of its ecological requirements, and identification of key restoration sites will have been completed. On-going nontidal perennial aquatic habitat restoration projects in the Bay-Delta will have been evaluated according to their success or potential support for restoring rare native

plant species and lessons learned applied to new projects.

RESTORATION ACTIONS

The targets for eel-grass pondweed include identifying and protecting high-quality habitats and populations throughout the range of this species in the study area, and ensuring the long-term viability of the species on higher ranked sites. Implementation of the following actions would contribute to achieving the targets:

- Conduct a site-based evaluation of populations, develop criteria on habitat and population conditions, and rank all sites based on the criteria in terms of low- to high-quality. Based on the ranking of sites identify the higher ranked sites for protection.
- Protect higher ranked sites through acquisition or cooperative efforts with landowners.
- Conduct studies to determine the microhabitat requirements of eel-grass pondweed and determine reasons for limited distribution.
- Develop and implement a habitat management plan to protect eel-grass pondweed on higher ranked sites.

MSCS CONSERVATION MEASURES

The following conservation measures were included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions that would help achieve species habitat or population targets.

- Conduct surveys in suitable habitat areas that could be affected by CALFED actions to determine whether species are present before implementing actions that could result in loss or degradation of occupied habitat.

REFERENCES

- Hickman, J.C. (ed.). 1993. The Jepson Manual, Higher Plants of California. University of California Press, Berkeley, CA.
- Mason, H. L. 1957. A flora of the marshes of California. University of California Press, Berkeley, CA.

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Munz and Keck. 1973. A California flora and fauna supplement. University of California Press, Berkeley, CA.

Natural Diversity Data Base. 1996. Records search for occurrences of Eel-grass pondweed (*Potamogeton zosteriformis*). California Department of Fish and Game, Sacramento, CA.

Skinner, Mark W. And Bruce M. Pavlik. 1994. California Native Plant Society's inventory of rare and endangered vascular plant of California. Fifth edition. (Special Publication No. 1.) California Native Plant Society. Sacramento, CA.

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◆ VERNAL POOL SPECIAL-STATUS PLANT SPECIES

INTRODUCTION

Vernal pools are seasonally flooded depressions that support a distinctive biota adapted to periodic or continuous inundation during the wet season and desiccated soils during the dry season (Holland and Jain 1977, Holland 1978, Thorne 1984, Jones & Stokes Associates 1990). Vernal pools usually occur in troughs between the ridges of a gently rolling or reticulated landscape, in the depressions between small mounds in a landscape dotted by "mima mounds", or on localized flats or steps in a seasonally wet swale. Some appear as isolated anomalies on ridge tops or flat terrain. Vernal pools vary in size from several yards to well over 1 acre, but most range from several thousandths to a few tenths of an acre. The largest vernal pools are really seasonal lakes, like Olcott Lake at the Jepson Prairie Preserve in Solano County and Boggs Lake at the Boggs Lake Preserve in Lake County.

Vernal pools support a unique associated of plant species. Some of the plants are restricted to vernal pools, while others occur primarily in vernal pools but also occur in other seasonal wetland habitats. Vernal pools are well known for their high level of endemism (Jain 1976) and abundance of rare, threatened, or endangered species (Skinner and Pavlik 1994, Jones & Stokes Associates 1990).

SPECIES DESCRIPTIONS

DESIGNATED FOR CONTRIBUTE TO RECOVERY

ALKALI MILK-VETCH (*Astragalus tener* var. *tener*) is rare, threatened, or endangered in California and elsewhere by CNPS (List 1B). Historical distribution of Alkali milk-vetch includes Alameda, Contra Costa, Merced, Monterey, Napa, San Benito, San Francisco, San Joaquin, Solano, Sonoma, Stanislaus, and Yolo Counties. Currently its distribution is Merced, Napa, Solano, and Yolo Counties. The primary threat to this species is sheep and cattle grazing (NDDB 1996).

CRAMPTON'S TUCTORIA (*Tuctoria mucronata*) is a sticky, aromatic annual grass, with a dense spike

of overlapping flower spikelets that emerge from the upper leaves. Crampton's tuctoria is state and federally listed as endangered and CNPS list 1B. It occurs in only two counties Solano and Yolo. It grows in the clay bottoms of drying vernal pools and lakes. The Nature Conservancy owns and protects a portion of the habitat at the Jepson Prairie Preserve, but the plant has not been seen since 1987 at the preserve (DFG 1992). Threats to the two known occurrences include alternation of local drainage patterns that feed the pools, off-road vehicle recreation, local farming operations; and trampling by livestock. Roads and transmission corridors have also degraded the habitat. Most of Crampton's tuctoria habitat is privately owned. The USFWS has prepared a recovery plan for Crampton's tuctoria which provides management recommendations (DFG 1992).



VISIONS

The vision for alkali milkvetch is to contribute to the recovery of this California Native Plant Society List 1B plant species.

The vision for Crampton's tuctoria is to contribute to the recovery of this federally and State-listed endangered species.

DESIGNATED FOR MAINTAIN

COLUSA GRASS (*Neostapfia colusana*) is a pale green annual member of the grass family (Poaceae), with several stems of loosely folded, clasping leaves and thick terminal spikes of flowers. Colusa grass is state listed as endangered and federally listed as threatened. It is considered rare, threatened, or endangered in California and elsewhere by the California Native Plant Society (CNPS) List 1B. Colusa grass grows in the bottoms of large or deep vernal pools with substrates of adobe mud and is somewhat resistant to light grazing. Colusa grass is endemic to the southern Sacramento and northern San Joaquin Valleys. Its historical distribution included Merced, Stanislaus, Solano and Colusa Counties, but is now extirpated from Colusa County. Two new populations have been found in Yolo

County. The primary reasons for decline of Colusa grass include the conversion of vernal pools to agricultural and developed lands, heavy grazing by cattle, and competition from introduced weedy species that tend to displace it. (DFG 1992)

BOGGS LAKE HEDGE-HYSSOP (*Gratiola heterosepala*) is a small, semi-aquatic, herbaceous annual in the figwort family (Scrophulariaceae). It has opposite leaves, blunt, unequal sepals, and yellow and white flowers on short stalks. Boggs Lake hedge-hyssop is state endangered and considered rare, threatened, or endangered in California and elsewhere by CNPS (List 1B). Boggs Lake hedge hyssop is found in Fresno, Lassen, Lake, Madera, Modoc, Placer, Sacramento, Shasta, San Joaquin, Solano, and Tehama counties and in Oregon. This species is found in shallow waters or moist clay soils of vernal pools and lake margins. Boggs Lake hedge hyssop has undergone substantial habitat reduction from development and agricultural conversion. Current threats include agriculture, development, grazing, and ORV's. Many occurrences are on privately owned land. (DFG 1992)

CONTRA COSTA GOLDFIELDS (*Lasthenia conjugens*) is a showy spring annual in the aster family (Asteraceae) that grows 10 to 30 centimeters tall with opposite light green leaves. Contra Costa goldfields is federally listed as endangered and is on CNPS list 1B. The historical distribution of Contra Costa goldfields extended from Mendocino to Santa Barbara Counties. Currently its distribution is limited to a few locations in Solano and Napa Counties. It inhabits vernal pools and seasonally moist grassy areas. In the past, the species may have also occurred in coastal prairies (Ornduff 1979). The decline of the Contra Costa goldfields has been attributed to the loss of vernal pools by development and agriculture. Continued threats include urbanization and overgrazing.

LEGENERE (*Legenere limosa*) is a slender annual that grows in wet margins of deep vernal pools. Legenere is considered by the U.S. Fish and Wildlife Service (USFWS) to be a species of concern and CNPS list 1B. Historical distribution of Legenere includes Lake, Napa, Placer, Sacramento, San Mateo, Solano, Sonoma, Stanislaus and Tehama Counties. It has now become extirpated from Sonoma and Stanislaus Counties. At the Jepson Prairie Preserve it

is found in the bottom of hogwallow. Threats to this species are primarily loss of vernal pools by agriculture. Other threats include grazing and development.

HEARTSCALE (*Atriplex cordulata*) is considered by the USFWS to be a species of concern and CNPS list 1B. Distribution of heartscale includes Alameda, Contra Costa, Butte, Fresno, Glenn, King, Kern, Madera, Merced, Solano, and Tulare Counties and no longer occurs in San Joaquin, Stanislaus or Yolo Counties (NDDB 1996).



VISIONS

The vision for Colusa grass is to maintain populations of this federally listed threatened and State-listed endangered species.

The vision for Boggs Lake hedge-hyssop is to maintain populations of this State-listed endangered species.

The vision for Contra Costa goldfields is to maintain populations of this federally listed endangered species.

The vision for legenere is to maintain populations of this California Native Plant Society List 1B plant species.

The vision for heartscale is to maintain populations of this California Native Plant Society List 2 species.

The vision for vernal pool plant species is to provide protection for and enhance existing populations. Existing populations should be protected through acquisition or cooperative efforts with landowners, beginning with the highest quality sites. Preservation and proper management of all existing populations would ensure the long-term viability of the species. To provide for proper management on protected sites, research would be conducted to determine the optimal conditions for the growth. For example, on sites with a high cover of non-native species, experimental burning and/or grazing would be conducted to determine if such treatments are beneficial for the species. Colusa grass's response to light and moderate grazing could also be